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RESEARCH SUMMARY

Jan. 1993 RS-008

forest sciences
NELSON FOREST REGION

The Relationship of Site Index and the Ecological Classification for our Forest Region

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INTRODUCTION

Estimates of site productivity are required to address various forest management concerns such as: prediction of timber yields, prioritization of silvicultural treatments, and comparison of potentially competing land uses.

While the biogeoclimatic ecosystem classification (BEC) is used by the Forest Service as a framework to describe forest and range sites, the BEC system and site productivity information have, to date, seldom been correlated. When the two have been investigated, useful trends have been revealed (Klinka and Carter 1990, Carter and Klinka 1992, Wang et al. 1992). The advantage of correlating site index (SI) (average top height at an index age) to the ecological classification is the ability to estimate site productivity on areas without trees where conventional site index cannot be measured.

In the Nelson Forest Region, estimates of SI were gathered during sampling of biogeoclimatic classification plots from 1977 to 1982. This data was originally analyzed using Forest Service Inventory Branch site index curves (Hegyi et al.1979). These curves are based on temporary sample plots. Using these curves and the BEC SI data, an unpublished paper "Site Index by Ecosystem Association" was produced and distributed to district and regional staff in the Nelson Forest Region in 1984.

PROJECT DESCRIPTION

Under the direction of the research ecologist (Braumandl), a project was undertaken by Oikos Ecological Consultants to:

- utilize more accurate curves generated from permanent plots and stem analysis (Thrower et al. 1991);
- eliminate sample trees not suitable for site index calculation; and
- make comparisons of SI between site series, zonal site series between subzones, and between species within a site series where data allowed.

As a result, a report was produced in 1990 entitled, "Site Index of Commercial Tree Species in the Biogeoclimatic Groups and Site Classification Units in the Nelson Forest Region" by D.S. McLennan.

To produce the report, McLennan analyzed data from the original biogeoclimatic classification plots with the new curves (3779 trees in 1955 plots were used). Sample trees that were too old or were in lower canopy positions were eliminated, weaknesses in the data were outlined, and suggestions were made for further work. The site index curves utilized in this report are presented in Thrower et al. (1991) for lodgepole pine, spruce, Douglas-fir, western hemlock, and western redcedar. Ponderosa pine, western larch, western white pine, and subalpine fir were also examined using other stem analysis or permanent sample plot-derived equations.

RESULTS

In general, site index increases with soil moisture within a subzone or variant (Figure 1). At the wettest end of the soil moisture gradient, site index was reduced in some variants. On site series with

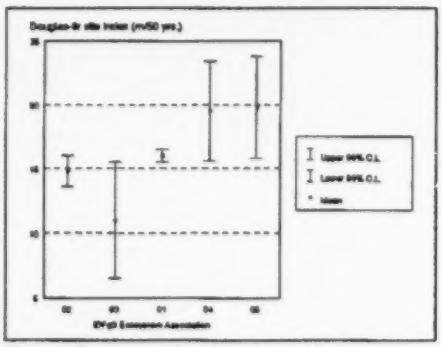

Figure 1 Douglas-fir site index for ecosystem associations (site series) in the IDFg3 (IDFdm2) biogeoclimatic variant.

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sufficient plots to allow comparison, lodgepole pine had the highest mean site index (Figure 2). The higher lodgepole pine site index is in contrast to patterns seen using the old site index curves and reported in American literature (Pfister et al. 1977, Cooper et al. 1987) for related ecosystems. These other sources usually found that lodgepole pine had lower site indices than western larch, Douglas-fir, western white pine, and ponderosa pine on a given site. Trends in site index between biogeoclimatic zones generally followed the following decreasing sequence: Interior Cedar-Hemlock (ICH), Montane Spruce (MS), Interior Douglas-fir (IDF), Engelmann Spruce - Subalpine Fir (ESSF) (Figure 3). Although trends are revealed, confidence intervals of the means were often wide.

FUTURE DIRECTIONS

The report was prepared based on the 1986 ecological classification (Utzig et al. 1986). Recently a new classification has been completed (Braumandl and Curran 1992). A new report using the new classification will be prepared.

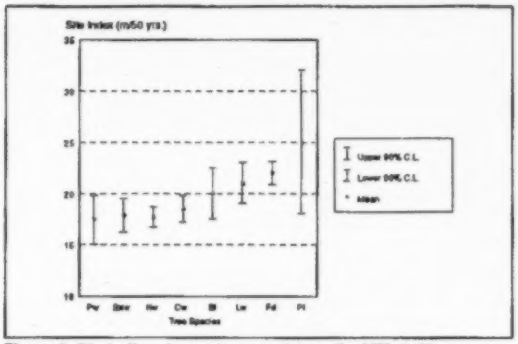

Figure 2 Site indices for various species on the ICHa2/01 Pandstima - Orthilia ecosystem association.

The site index data will be resorted according to the new site series and more accurate site equations for a number of species will be used. Grouping the plots on the basis of site association (site associations are groupings of site series with similar vegetation from different subzones) may improve the precision of the estimates by providing a larger sample size per strata.

Inventory Branch is currently ecologically classifying all permanent growth and yield plots. These plots were sampled more rigorously and may yield better mensurational data. However, the number of replications per ecological unit may be low due to the extensive nature of the sampling and not all site series will be represented. This project will be completed for the Interior by 1994 (Joe Brar, Inventory Branch, pers. comm.).

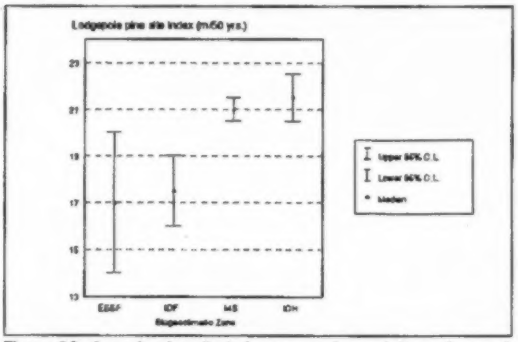

Figure 3 Lodgepole pine site index on zonal associations of several biogeoclimatic zones of the Nelson Forest Region.

A study to investigate the wide variability in site index seen in the Engelmann Spruce - Subalpine Fir (ESSF) zone (eg. Figure 3) is planned in 1993 (Klinka, pers. comm. 1992). The relative performance of various species on a particular site, specifically lodgepole pine, requires further study.

The correlation of site index and other measures of productivity with the widely utilized BEC framework is being examined by both Inventory and Research Branches.

REFERENCES

Braumandl, T.F. and M.P. Curran. 1992. *A field guide for site identification and interpretation for the Nelson Forest Region.* Land Manage. Handb. 20. B.C. Min. For., Victoria, B.C.

Carter, R. and K. Klinka. 1992. *Use of ecological site classification in the prediction of forest productivity and response to fertilization.* South African Forestry Journal No. 160.

Cooper, S.V., K.E. Neiman, R. Steele, and D.W. Roberts. 1987. *Forest habitat types of northern Idaho: a second approximation.* U.S. Dep. Agric., For. Serv., Intermtn. For. Range Exp. Stn., Ogden, Utah. Gen. Tech. Rep. INT-236

Hegyi, F., J. Jelinek, and D.B. Carpenter. 1979. *Site index equations and curves for the major tree species in B.C.* B.C. Min. For., Inventory Br., Victoria, B.C. For. Inventory Rep. No. 1.

Klinka, K. and R.E. Carter. 1990. *Relationships between site index and synoptic environmental factors in immature coastal Douglas-fir stands.* Forest Science Vol. 36, No. 3.

Pfister, R.D., B.L. Kovalchik, S.F. Arno, and R.C. Presby. 1977. *Forest habitat types of Montana.* U.S. Dep. Agric., For. Serv., Intermtn. For. Range. Exp. Stn., Ogden, Utah. Gen. Tech. Rep. INT-34.

Thrower, J.S., A.F. Nussbaum, and C.M. Di Lucca. 1991. *Site index curves and tables for British Columbia: Interior species.* Field Guide Insert 6. B.C. Min. For., Research Branch. Victoria, B.C.

Utzig, G.F., P.G. Comeau, D.J. Macdonald, M.V. Ketcheson, T.F. Braumandl, A.R. Warner, and G.W. Still. 1986. *A field guide for identification and interpretation of ecosystems in the Nelson Forest Region.* Second revision. B.C. Min. For., Victoria, B.C.

Wang, Q., G. Wang, D. Coates, and K. Klinka. 1992. *Use of site factors in the prediction of lodgepole pine and hybrid white spruce site index in the SBS zone of the Prince Rupert Forest Region.* Contract report for B.C. Min. For., Prince Rupert Forest Region. Smithers, B.C.

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